



FOREST HEALTH PROTECTION



PACIFIC SOUTHWEST REGION

NORTHERN CALIFORNIA SHARED SERVICE AREA

NOBCCONE PINE MORTALITY AT OAK BOTTOM CAMPGROUND, WHISKEYTOWN UNIT, SHASTA-TRINITY-WHISKEYTOWN NRA



Knobcone pine (*Pinus attenuata*) occupies a transitional position between lower elevation chamise-manzanita-oak woodlands and higher elevation conifer forests. Discontinuous populations occur from southwestern Oregon south through the Klamath, Cascade and Coast Ranges and the Sierra Nevada. Within the knobcone pine community, the pines are usually widely spaced giving the sense of woodland rather than forest. However, on favorable sites, knobcone pine can form dense, even-aged stands. Most often, mosaics of chaparral, woodland, knobcone pine and other conifers occur across differing topographies and substrates (Vogl et.al. 1977). This is typical of Whiskeytown Unit, Whiskeytown–Shasta–Trinity National Recreation Area (NRA).



The Whiskeytown Unit is part of the Whiskeytown–Shasta-Trinity National Recreation Area established in 1965 by the United States Congress as part of the Central Valley Water Project, providing water for agriculture. President John F. Kennedy dedicated the lake in 1963. The Forest Service manages the Shasta and Trinity Units with four lakes and over 203,000 acres. The National Park Service manages the Whiskeytown Unit which is comprised of 39,000 acres surrounding Whiskeytown Lake. The lake is favored by locals for the clear deep water and wildlife that surround the lake's 36 miles of forested shoreline.

Knobcone pine is described by Howard (1992) as:

- A rapidly growing tree from 20 to 40 feet tall and 13.5 to 23 inches in DBH.
- The crown is dense and broad when young, becoming open as it matures.
- Trees are thin barked and may have a single or multiple stems.
- Trees produce female cones in groups of four or five, all firmly attached to stout branches in a tight whorl.
- Cones remain closed and firmly attached for the entire life of the tree.
- The enclosed seeds are small and light, with long seed wings.
- The species is not known to be subject to heavy insect or disease attack (Vogl et.al. 1977).

The lifespan of knobcone pine is relatively short. Some trees reach ages of 75 to 100 years, but in a typical 60-year-old stand, over half the pines are often dead (Howard 1992).

Fire is essential for the completion of knobcone pine's life cycle. Cones of senescent or dead trees must be opened by fire to disseminate the seeds before trees succumb and add the unopened cones to the decomposing litter. Unlike other closed-cone species whose cones open with hot weather, upon falling, or with age, unburned knobcone pine cones remain closed even after trees have fallen and decayed. Resin sealing the cones requires high temperatures (average: 397° F) to liquefy and vaporize. Cone scales open gradually following heating causing the first seeds to fall within 12 hours after fire, when the ground has cooled. The scales continue to expand and drop seed for four years postfire. The small, light seeds are primarily wind dispersed, but birds may aid in disseminating seed.

Seed viability does not seem to decline with age. Following release, seeds require cold stratification for 60 days. Germinative capacity of seeds from mechanically opened cones has varied from 57 to 91 percent (Howard 1992). Extremely hot fire may kill some seed. Laboratory tests show that germination rates of seed from mechanically opened cones are greater than those of cones opened by oven heat treatment (Howard 1992). Seedlings require bare mineral soil for establishment. In the absence of fire, knobcone pine is replaced by chaparral shrub species at lower elevations and other conifers at higher elevations.

Ecosystems dominated by knobcone pine are often characterized by infrequent high intensity, high severity fires. The dependency of knobcone pine on stand replacing fire presents a challenge for natural resource managers to effectively manage this type of vegetation and fire dependent ecosystems in general. Vegetation management through the use of prescribed crown fires is extremely problematic (potential for escape into urbanized settings, impacts on regional air quality, and constrained operational periods) especially in wildland-urban interface and high-valued recreation areas such as Whiskeytown National Recreation Area.

In Oak Bottom Campground at Whiskeytown NRA, many of the knobcone pines are greater than 75 years old and exhibiting signs of decreased vigor. Increasing mortality has been noted for the past several years due primarily to Ips and



Buprestid species taking advantage of the declining vigor. The first indication of attack is reddish-orange boring dust which appears in bark crevices, spider webs, and on the ground at the base of the tree. Some infested trees fade by late summer or early fall during the same year they are attacked, while others may not fade until the following spring.



Current vegetation management at the Whiskeytown Unit is a practice of hazard tree removal. Dead trees are flagged and removed during the winter and early spring months prior to the busy camping season. This does nothing to stop the mortality nor does it provide a new cohort of trees to take the place of the trees being removed. Management should focus on establishing the next cohort of trees where mortality is highest, opting for a mix of species that are drought tolerant and able to withstand some of the stresses particular to recreation areas.

Prior to fire suppression, knobcone pine forests probably burned in the late summer or fall when ignitions were most common and fuel moisture and weather conditions were conducive to burning. Using prescribed fire as a management tool to maintain these forests is challenging due to the high intensity fires that are needed to open the cones. Vegetation management that uses prescribed fire as a treatment, especially high intensity crown fires, is difficult to implement due to operational, weather, air quality and resource limitations. While there may be opportunities to burn

knobcone pine forest using prescribed crown fires in outlying areas, relying on this method as the only treatment option is impractical.

Mechanical treatment (thinning to reduce stress on residual trees) could be followed up with prescribed burning. However, results have been mixed for maintaining knobcone pine due to the high heat required to open the cones. There is also the potential issue of a delay in conducting the burns after the forest has been mechanically treated. It is recommended that units be burned within six months after the mechanical treatment (Dawson et.al. 2007). If burning is done as a treatment, it is recommended that the burning be done in the fall. With spring treatments cones open, releasing seeds but these seeds will remain dormant until the following spring since this coincides with the beginning of the summer drought. This provides seed predator's extensive opportunities to capture the seed bank. The fall treatments, which coincide with the beginning of the wet season, may fare better due to the opportunity for seeds to germinate and establish themselves prior to the onset of the dry season when seed predators are more active.



References

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